

A NEW SPECIES OF *DICROPLEON* AND NEW RECORDS OF THREE OTHER SPECIES OF BOPYRID ISOPODS FROM THE INDIAN OCEAN

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ABSTRACT

Specimens of four species of Indian Ocean bopyrid isopods providing either new host and distributional records or resolution of systematic problems are dealt with. A specimen from the Gulf of Manaar previously recorded under the name of *Hemiarthrus* (?) sp. is described as *Dicropleon processae* new species; it infests the shrimp *Processa aequimana* Paulson. *Aporobopyrus ryukyuensis* Shiino and *Aporobopyrina lamellata* Shiino are recorded from Karachi, Pakistan, where they infest new porcellanid hosts, *Petrolisthes boscii* (Audouin) and *P. rufescens* Heller, respectively. *Megacepon choprai* George is recorded from Samat Sakhan, Thailand, infesting a new host, the grapsid crab *Sesarma mederi* H. Milne Edwards; the male of *M. choprai* is described for the first time.

Representatives of four species of bopyrid isopods from various parts of the Indian Ocean have become available for examination. Each species has heretofore represented a separate problem, whose resolution should improve knowledge of the interrelationships and distribution of bopyrid isopods both in the Indian Ocean and elsewhere. The following institutional abbreviations apply: RMNHL, Rijksmuseum van Natuurlijke Historie Leiden; USNM, U.S. National Museum of Natural History, Smithsonian Institution; ZMC, Universitetets Zoologiske Museum, Copenhagen; and ZSI, Zoological Survey of India, Calcutta.

Aporobopyrus ryukyuensis Shiino, 1939

Figures 1, 2

Aporobopyrus ryūkyūensis Shiino, 1939: 81-84, 87; figs. 3, 4 [Type-localities, Benoki, Okinawa-zima, Ryūkyū; infesting *Petrolisthes hastatus* Stimpson; and: Kabira, Isigaki-zima, Yaeyama Group, Ryūkyū; infesting *P. asiaticus* Leach]; 1942: 437, 441 [Ngadarak Reef, Palao; infesting *P. lamarcki* (Leach) and *P. fimbriatus* Borradaile]. Danforth, 1970: 462.

Aporobopyrus ryukyuensis. Shiino, 1964: 22. Markham, 1975: 264, 265. Bourdon, 1976: 166, 183, 184-187, 190, 220, 240; figs. 12, 13 [Palao; infesting *P. fimbriatus*; one female hyperparasitized by *Cabirops* sp.].

"Bopyrid." Ahmed and Mustaqim, 1974: 173, 179, 180, 181; tab. 4 [Karachi, Pakistan; infesting *P. boscii* (Audouin)].

Material Examined.—Infesting *Petrolisthes boscii* (Audouin). Manora Island, Karachi, Pakistan, 11 April 1976, M. Ahmed, coll. and det. of host: 1 ♀, 1 ♂, USNM.

Diagnosis.—Female: Frontal lamina of head extended into lateral points typical for genus; maxilliped palp prominent and setose but not articulated; dorsolateral bosses on only first four or five pereomeres; coxal plates much reduced or absent on most pereomeres; brood pouch completely enclosed by oostegites; oostegite 1 with blunt posterolateral point; pleonal lateral plates ovate. Male: Head markedly narrower than pereon; pereomeres produced into angled lateral margins, broadest regions of first two nearer anterior edges than posterior ones; pereopods of first two pairs very much larger than others.

Discussion.—*Aporobopyrus ryukyuensis* has been very well described and illustrated by Shiino (1939) and Bourdon (1976), so a detailed redescription is not included here. The characters of both the female (Fig. 1) and the male (Fig. 2)

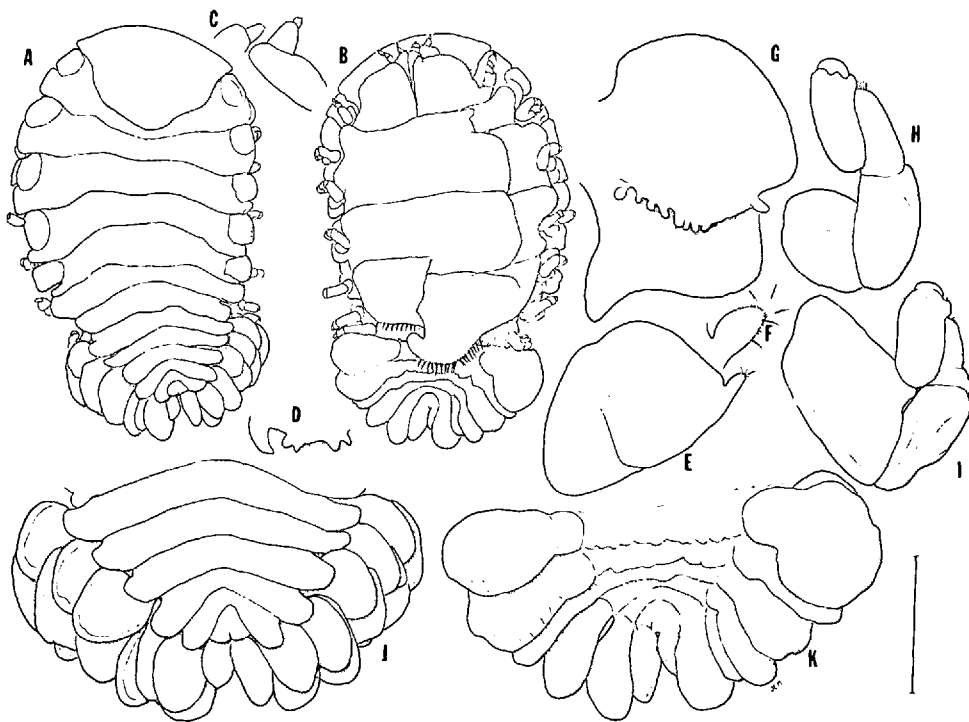


Figure 1. *Aporobopyrus ryukyuensis* Shiino, Female. A. Dorsal. B. Ventral. C. Left antennae. D. Posteroventral border of head. E. Right maxilliped. F. Palp of right maxilliped. G. Left oostegite 1, internal. H. Left pereopod 1. I. Left pereopod 7. J. Pleon, dorsal. K. Pleon, ventral. Scale: 2.0 mm for A, B; 1.0 mm for J, K; 0.9 mm for D; 0.8 mm for E, G; 0.5 mm for C; 0.3 mm for F, H, I.

examined are within the ranges of variation previously recorded for the species. One noteworthy finding is the presence of rudimentary pleopods in the male (Fig. 2G) in the form of ill-defined discoid marks on the first five pleomeres.

The host species, *Petrolisthes boscii*, has been recorded as the host of *Pleurocrypta yatsui* (Pearse) in the Red Sea by Bourdon (1976), but not previously as the host of *Aporobopyrus ryukyuensis*. This is also the first record of the occurrence of *A. ryukyuensis* in the Indian Ocean, previous records being from the western Pacific.

Aporobopyrina lamellata Shiino, 1934

Figures 3–5

Aporobopyrina lamellata Shiino, 1934: 263–265, 267; fig. 3 [Type-locality, Yasaki, Seto, Japan; infesting *Petrolisthes coccineus* (Owen)]; 1936: 161 [Shimoda, Japan; infesting *P. hastatus* Stimpson]; 1952: 39. Bourdon, 1972: 114; 1976: 166, 215–219, 240, 241; figs. 31, 32 [Tuléar, Madagascar; infesting *P. penicillatus* (Heller) and *P. lamarcki* (Leach); and: Santa Cruz Pavad, Mindanao, Philippines; infesting *P. lamarcki*].

“Bopyrid.” Ahmed and Mustaqim, 1974: 173, 179, 180, 181; tab. 4 [Karachi, Pakistan; infesting *Petrolisthes rufescens* Heller].

Material Examined.—Infesting *Petrolisthes rufescens* Heller. Manora Island, Karachi, Pakistan, 11 April 1976, M. Ahmed, coll. and det. of hosts: 4♀, 3♂, USNM; 3♀, 2♂, RMNHL.

Diagnosis.—Female: Body oval, about two-thirds as wide as long; frontal lamina and coxal plates well developed and forming continuous border around body;

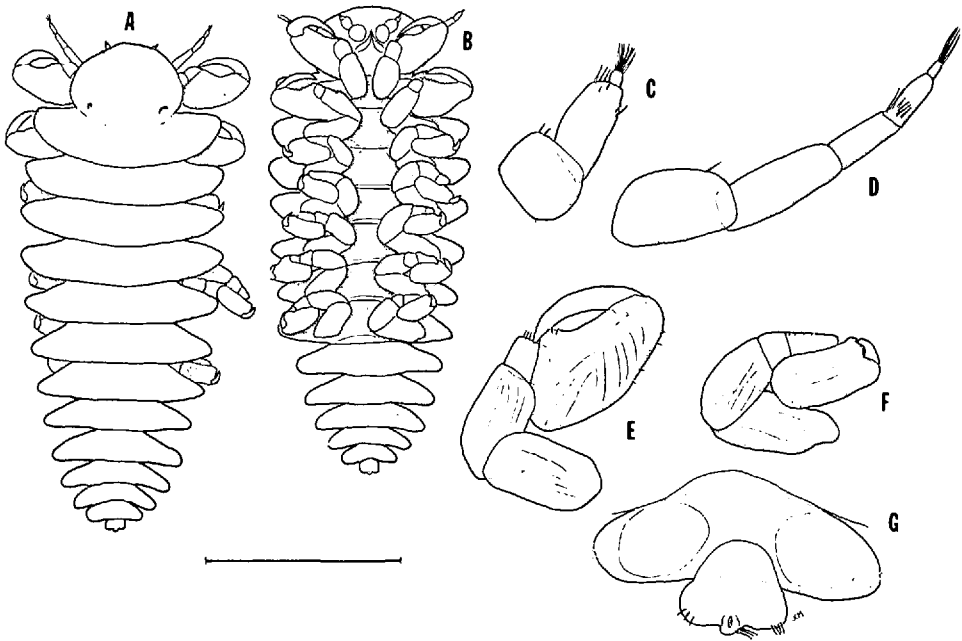


Figure 2. *Aporobopyrus ryukyuensis* Shiino, Male. A. Dorsal. B. Ventral. C. Left antenna 1. D. Left antenna 2. E. Left pereopod 1. F. Left pereopod 7. G. End of pleon, ventral. Scale: 1.0 mm for A, B; 0.4 mm for E, F; 0.2 mm for C, D, G.

maxilliped with anteromedial setae instead of palp; dorsolateral bosses on pereomeres 1–4, pleon very little extended beyond pereon, of six pleomeres, first five bearing reduced lateral plates and prominent ovate biramous pleopods, sixth pleomere much reduced and with biramous uropods. Male: Body ovate, sides rounded and both head and pleon somewhat extended; eyes tiny or absent; antennae extended; pereomeres with midventral tubercles; pereopods 1–3 with dactyli longer and carpi shorter than on other pereopods; pleon extremely variable, of one to five pleomeres, lacking all appendages.

Discussion.—Like the preceding species, *Aporobopyrina lamellata* has been well described by Shiino (1934) and Bourdon (1976), and the present material conforms with those descriptions in most respects. The females of *A. lamellata*, while varying somewhat, do so much less than those of *A. anomala* Markham (1974). The males are quite consistent in most characters except for their pleons; in the present material, every one is noticeably different (Fig. 5A, G–J). A fully developed microniscan larva from the brood pouch of one of the females is illustrated (Fig. 4H). It appears to be quite typical for the family.

A. lamellata is already known from the Indian Ocean in that Bourdon (1976) reported it from Madagascar. This is the first record of its occurrence on *P. rufescens*, which Nobili (1906) recorded as the host of *Aporobopyrus aduliticus* Nobili in the Red Sea.

Megacepon choprai George, 1946

Figure 6, 7

Megacepon choprai George, 1946: 385–390; figs. 1–3 [Type-locality, Adyar River, near Madras, India; infesting *Sesarma tetragonum* (Fabricius)]. Shiino, 1958: 65–68; figs. 20–21 [Asahi River, Okayama, Japan; infesting *Sesarma dehaani* H. Milne Edwards].

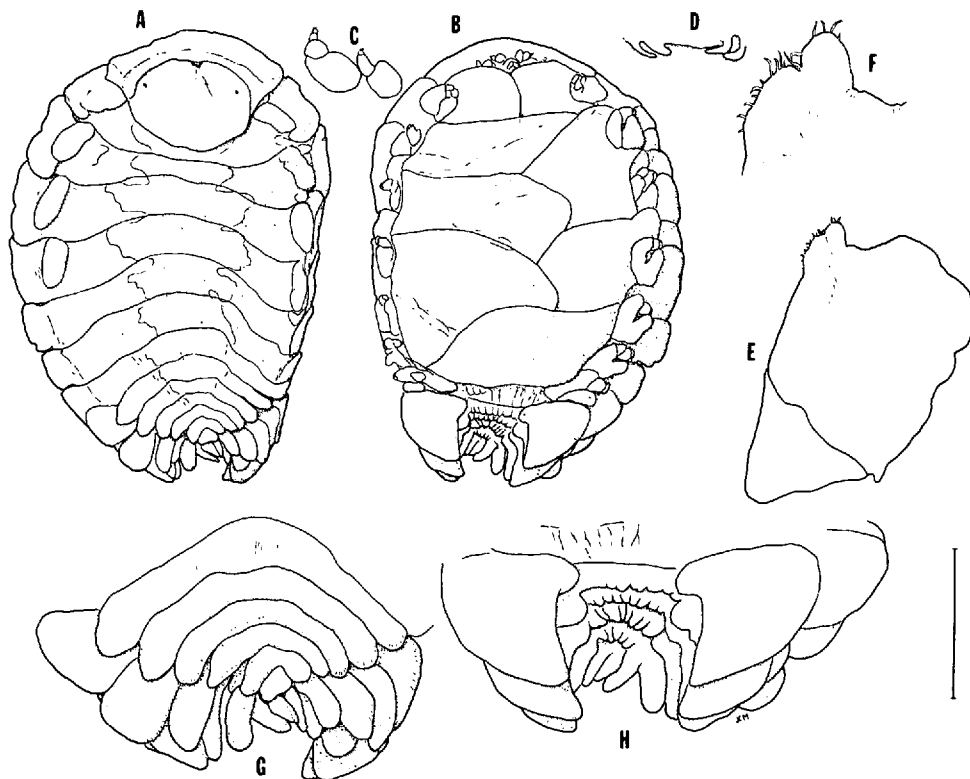


Figure 3. *Aporobopyrina lamellata* Shiino, Female. A. Dorsal. B. Ventral. C. Right antennae. D. Posteroventral border of head. E. Left maxilliped. F. Palp of left maxilliped. G. Pleon, dorsal. H. Pleon, ventral. Scale: 2.0 mm for A, B, D; 1.0 mm for G, H; 0.8 mm for E; 0.5 mm for C; 0.3 mm for F.

Megacepon choprae.—Bourdon and Bowman, 1970: 422.

Material Examined.—Infesting *Sesarma mederi* H. Milne Edwards. In mangroves, Samut Sakhon, Thailand, 1976: 5♀, 2♂, USNM; 4♀, ZMC.

Diagnosis.—Female: Head extended from pereon, bearing reduced frontal lamina pressed against anterior margin but not extending laterally; pereomeres 1–6 with prominent middorsal bosses, last one bifid and very broad; pereopods tiny, with bases produced into carinae; pleon of six pleomeres, first with small triangular middorsal projection, second with large reflexed cordate middorsal projection; lateral plates, biramous pleopods and long uniramous pleopods all with deeply digitate margins. Male: Body very elongate; pereopods rather small, progressively larger posteriorly; midventral projections on all pereomeres and all but final (sixth) pleomere; flat circular pleopods on pleomeres 1–5; pleomeres 6 produced into two triangular posterior points but lacking uropods.

Description of Male (Figure 7).—Body long and narrow, slightly curved, about three and one-half times as long as wide; all segments and body regions distinct; broadest, but only slightly so, across pereomere 4 (Fig. 7A, B).

Head blunt anteriorly, pointed laterally and much narrower than pereomere 1 at point of attachment. Dark eyespots above bases of antennae or colorless oblong depressions near posterolateral margins. Antenna 1 (Fig. 7C) of three segments,

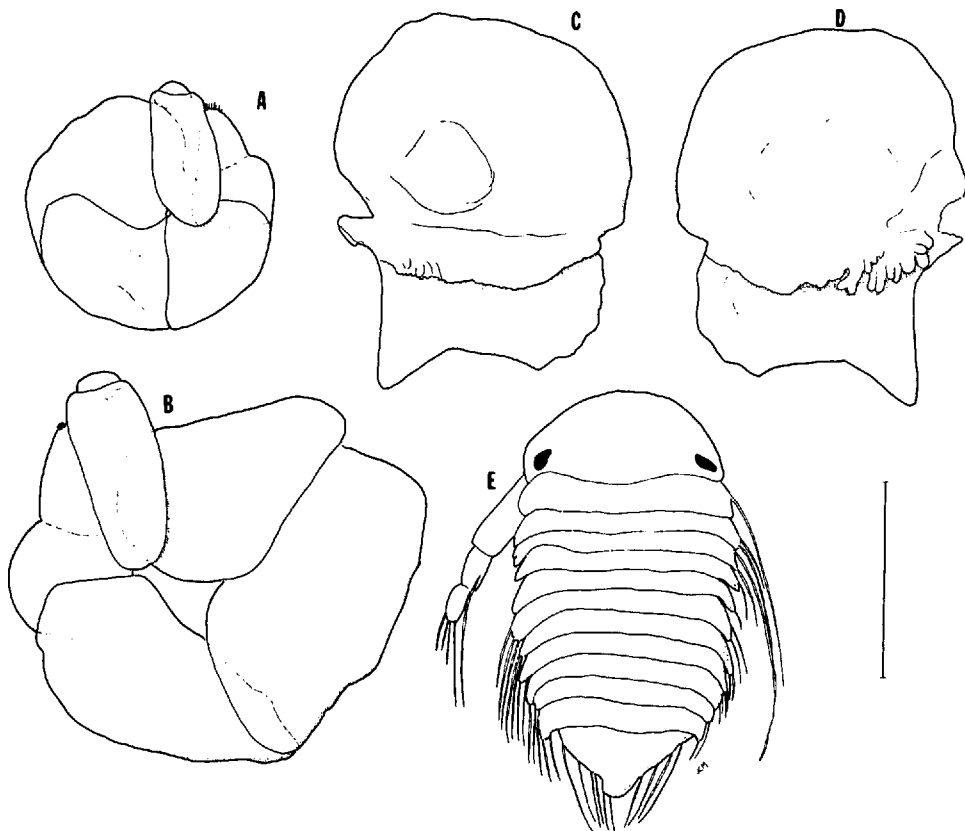


Figure 4. *Aporobopyrina lamellata* Shiino. A–D, Female. A. Right pereopod 1. B. Right pereopod 1. C. Right oostegite 1, external. D. Same, internal. E. Microniscan larva, dorsal. Scale: 1.0 mm for C, D; 0.4 mm for A, B; 0.1 mm for E.

each smaller than that proximal to it, all setose distally; antenna 2 (Fig. 7D) of seven segments, progressively smaller distally, few setose.

Pereomeres moderately to deeply separated laterally; prominent subquadrangular midventral tubercle on each, that on pereomere 6 largest. All pereopods rather small but progressively somewhat larger and with less sharply pointed dactyli posteriorly (Fig. 7E, F); propodus of each produced into distal "cup" receiving tip of retracted dactylus, this most prominent on pereopods 3–5.

Pleon of six pleomeres, each somewhat narrower than that before it, sides of pleon thus tapering smoothly. Pleomeres 1–5 bearing midventral tubercles large and ovate anteriorly to tiny and circular posteriorly. Pair of somewhat extended discoid pleopods on each of first five pleomeres, gradually smaller posteriorly. Final pleomere subcordate, produced into pair of posterior triangular projections; rounded anal cone extending slightly from ventral surface near posterior margin. No uropods, but tufts of minute setae on tips of posterior projections suggesting traces of them (Fig. 7G).

Discussion.—The original description of *Megacepon choprai* by George (1946) was quite complete, but the illustrations were inadequate, so some questions remained about certain characters of the species and its genus. Shiino (1958)

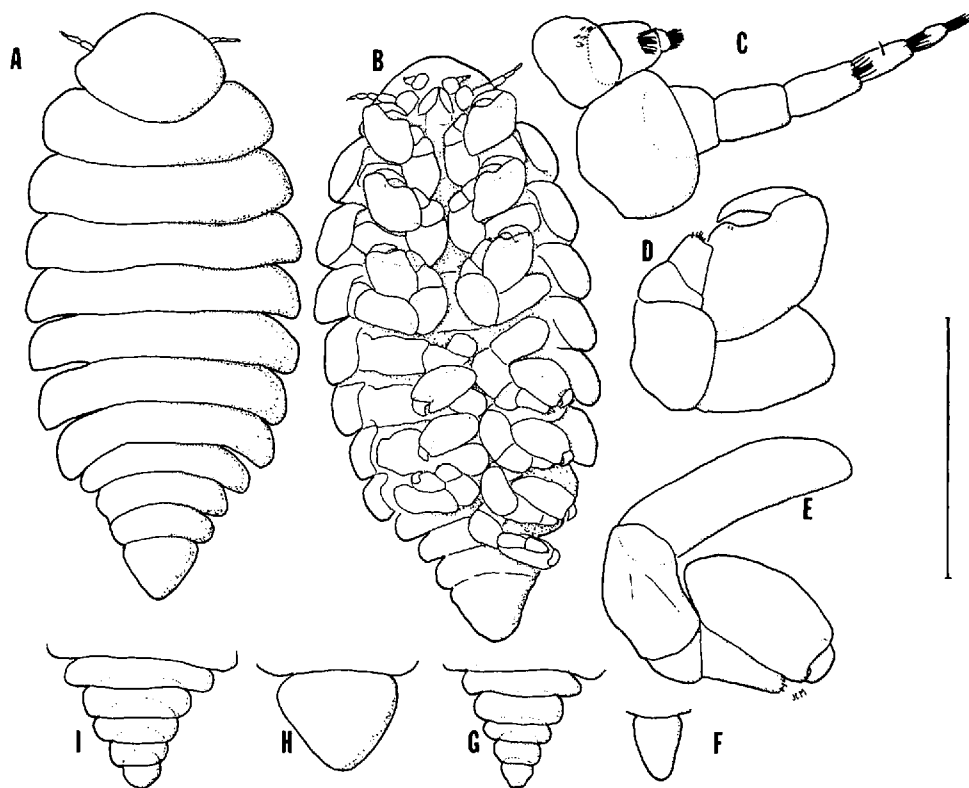


Figure 5. *Aporobopyrina lamellata* Shiino, Males. A. Dorsal. B. Ventral. C. Left antennae. D. Left pereopod 1. E. Left pereopod 6. F-I. Pleons of other males, dorsal. Scale: 1.0 mm for A, B, F-I; 0.4 mm for D, E; 0.2 mm for C.

presented a fine redescription and illustrations, but, as had George, he lacked a male.

The female needs no further description beyond those of George and Shiino cited. The present material conforms well with those descriptions in all significant details. George described a triangular tubercle on the final pereomere, which Shiino did not mention. Each of the females in the present collection has such a tubercle or projection, but it arises from the first pleomere rather than from the last pereomere. The large extended projection on the second pleomere, the main reason cited by George for the creation of the genus *Megacepon*, seems to be unique to this species. One of the females in the present collection was quite immature (Fig. 6). Besides being much smaller than the others, it is relatively much narrower; otherwise it conforms well with the description of Shiino (1958).

Megacepon belongs in that section of the bopyrid subfamily Ioninae in which the females have middorsal pereonal bosses and biramous pleopods with digitate margins. The only other such genera are *Leidya* and *Cardiocepon*. *Leidya* contains four described species. Bourdon & Bowman (1970) have presented detailed redescrptions of the two species from the western Atlantic, *L. distorta* (Leidy) and *L. bimini* Pearse. The other two are somewhat doubtful species from China described by Pearse (1930). *Leidya* differs from *Megacepon* in that its females have distinctly bilobed heads and lack all pleonal middorsal projections. The

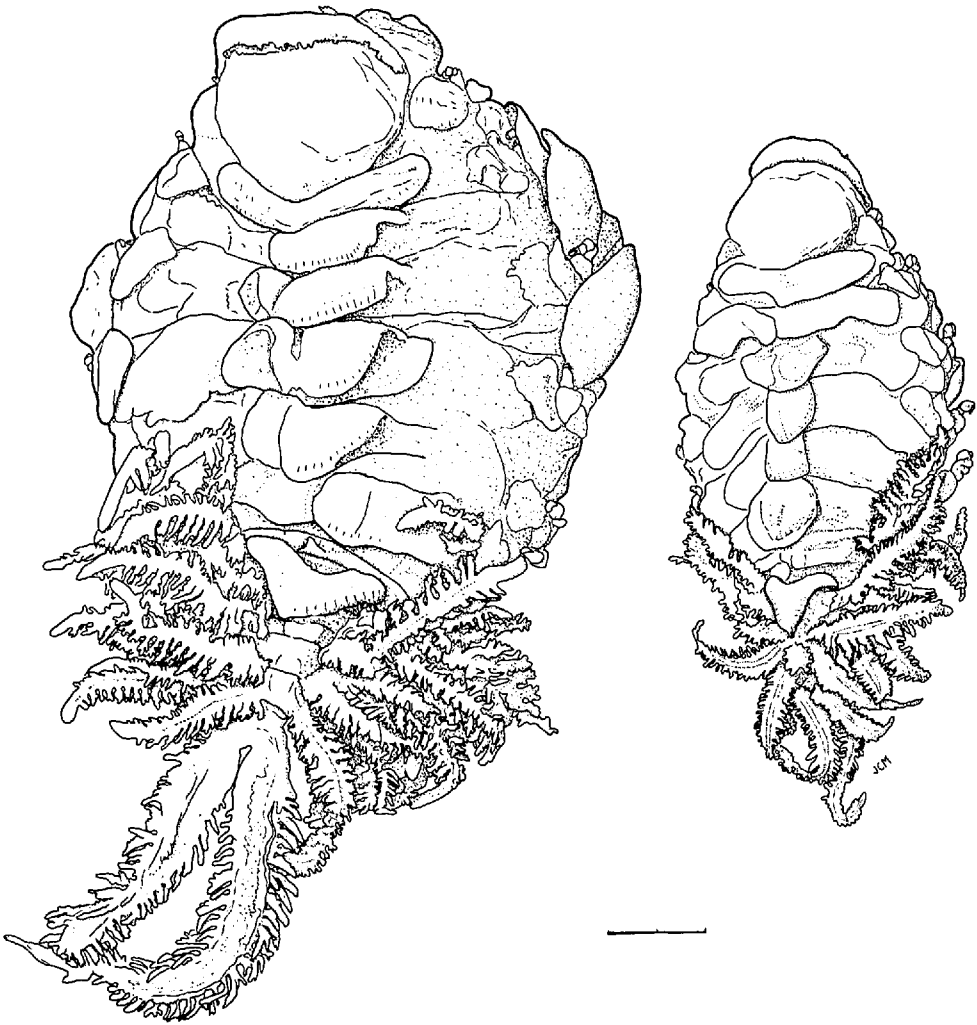


Figure 6. *Megacepon choprai* George, Mature and immature females. Scale: 2.0 mm.

female of *Cardiocepon pteroides* Nobili (1906), the sole described species of its genus, differs by lacking middorsal bosses on the more anterior pereomeres. The male of *C. pteroides* remains unknown, but those of *Leidya distorta*, *L. bimini* and *L. ucae* Pearse are closely similar to that of *Megacepon choprai*. This reaffirms that *Leidya* is a close relative of *Megacepon*. *Leidya* males have mid-ventral tubercles on all pereomeres and on either the first two (in *L. distorta*) or first five (in *L. bimini*) pleomeres; this is comparable to the condition of *Megacepon choprai*. In contrast, in males of *Leidya* the pleopods are sessile, and the uropods are long and filiform, while in the male of *Megacepon* the pleopods extend slightly from the surface of the pleomeres, and the uropods are represented only by tiny tufts of setae. As Bourdon & Bowman (1970) pointed out, members of these three genera infest hosts in the closely related families Gecarcinidae and Grapsidae. Those authors also considered it possible that *Leidya sesarmae* Pearse and *Megacepon choprai* were conspecific, but the present description of the male of *M. choprai* makes it clear that they are distinct at the generic level.

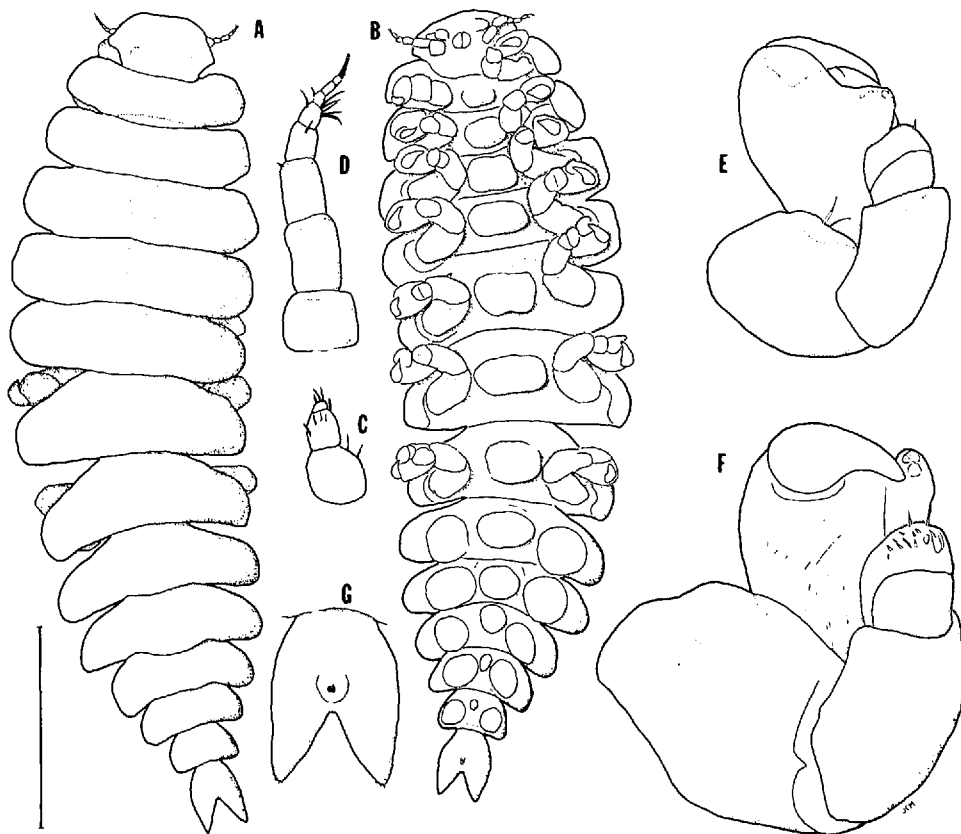


Figure 7. *Megacepon choprai* George, Male. A. Dorsal. B. Ventral. C. Right antenna 1. D. Right antenna 2. E. Right pereopod 1. F. Right pereopod 7. G. Pleon, ventral. Scale: 1.0 mm for A, B; 0.4 mm for G; 0.2 mm for C–F.

The present host of *M. choprai*, *Sesarma mederi*, has not previously been known to bear a bopyrid parasite. It is noteworthy that in the three discoveries of *M. choprai*, in India, Japan and now Thailand, each time it has infested a different species of *Sesarma*. *S. mederi* occurs only along the Malay Peninsula and Thailand through the Philippines and Indonesia (L. B. Holthuis, personal communication) so *Megacepon choprai* must infest other host species in order to cover its total known range, from India to Japan.

The females examined varied in length from 10.3 to 15.0 mm and in width from 5.4 and 10.0 mm. Although only one was clearly immature, only one female bore eggs in its brood pouch; four others had eggs developing in their ovaries. Four of the parasites infested their hosts on the right side, while five came from the left side.

Dicropleon processae, new species

Figure 8

Hemiarthrus (?) sp. Chopra, 1923: 416, 430, 431, 440–441; text-fig. 3 [Kilikari, Gulf of Manar; infesting *Processae* sp.].

Phrixus (*Hemiarthrus*?) spec. Nierstrasz and Brender à Brandis, 1931: 202.



Figure 8. *Dicropleon processae*, n. sp., Holotype female. A. Dorsal. B. Right Antennae. C. Left maxilliped. D. Left posteroventral margin of head. E. Left oostegite 1. F. Pereopods. G. Right pereopod 3. H. Pleon, ventral. I. Right lateral plate 2. J. End of Pleon, ventral. Scale: 2.0 mm for A, F, H, I; 1.6 mm for C, E; 1.0 mm for D, J; 0.5 mm for G; 0.3 mm for B.

Material Examined.—Infesting *Processa aequimana* Paulson. Kilikari, Gulf of Manaar, S. W. Kemp, coll., L. B. Holthuis, det. of host: 1♀, holotype, ZSI.

Diagnosis.—Female: Of general hemiarthrine form; body axis only moderately distorted, but brood pouch greatly extended forward on convex side; head large, cleft anteriorly; seven pereopods on concave side, three on convex side of which third far out on brood pouch and very reduced; pleon of five pleomeres, first four

with large lateral plates and biramous pleopods, final pleomere slightly cleft posteriorly and bearing claviform uropods. Male unknown.

Description of Holotype Female (Figure 8).—Head-pleon length 2.7 mm, overall body length 4.6 mm, maximal width 2.6 mm, head length 0.7 mm, pleon length 0.8 mm. Body axis distortion 35°.

Head deeply embedded in pereon, partly exceeded by first two pereomeres (Fig. 8A); convex portion of brood pouch extending far beyond head. Head deeply cleft anteriorly, somewhat swollen behind. Antennae (Fig. 8B) in cleft, first minute, of three articles and extending over large basal article of antenna 2; antennae 2 of five articles; each antenna with terminal tuft of setae. Maxilliped (Fig. 8C) distinctly bisegmented, posterior segment much larger; no palp. Posteroventral border of head (Fig. 8D) with two pointed projections on each side.

Pereon distinctly segmented only on convex side, demarcations completely obscured in expanded brood pouch. Oostegite 1 (Fig. 8E) subovate, about twice as long as broad, produced into narrow posterolateral projection. Pereopods (Fig. 8F) all present on concave side, first two of both sides clustered together next to head and larger than others; pereopods 3–7 of concave side all close together along side of pereon; pereopod 3 of convex side (Fig. 8A, G) on edge of brood pouch, with large basis while other articles minute though fully developed; pereopods 4–7 absent from convex side.

Pleon (Fig. 8A, H) of five pleomeres. Large subcircular lateral plates (Fig. 8I) on first four pleomeres, extending far to sides of body. Pleomeres 1–4 bearing biramous pleopods (Fig. 8H, J), each with exopodite larger than endopodite, each progressively smaller posteriorly. Final pleomere cleft posteriorly, with claviform uropod extending to each side of posterior margin. Male unknown.

Discussion.—Upon describing *Dicropleon periclimenis*, a parasite of *Periclimenes americanus* Kingsley at St. Lucia, West Indies (Markham, 1972), I expressed the opinion that *Metaphrixus bifidus* Bourdon (1967), a parasite of *Periclimenes inornatus* Kemp at Malé Atoll, Maldives, might also belong in the new genus *Dicropleon*. The major distinction is that the female of *Metaphrixus bifidus* lacks all pleopodal endopodites. Because the endopodites of the female of *Dicropleon periclimenis* are very reduced, and in all other important characters there is good agreement between these two species, I am hereby incorporating *Metaphrixus bifidus* into *Dicropleon*. The genus thus has two representatives in the Indian Ocean.

The female of *D. processae* differs from that of *D. periclimenis* in having endopodites slightly better developed. It differs from both *D. periclimenis* and *D. bifidus* in having uropods, although they are quite small. The important characters which the females of all three species share are: body axis only moderately distorted, first two pairs of pereopods in front of head, those of convex side slightly larger than pereopods 1 and 2 of concave side; pereopod 3 of convex side far out on brood pouch, extremely reduced but complete; all other pereopods of convex side absent; pereopods 3–7 of concave side fully developed but smaller than others and lined up close together; pleon of five pleomeres, first four with large lateral plates, terminal one cleft posteriorly. Further, in the females of both *D. periclimenis* and *D. processae*, the tiny first antenna extends over the large proximal article of the second antenna; the situation in *D. bifidus* is uncertain, but the published drawing (Bourdon, 1967) indicates that it is possibly the same. Unfortunately, the males of both *D. bifidus* and *D. processae* are unknown; if they are eventually collected, it will be interesting to learn how well they confirm this generic alignment.

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Dr. Muzammil Ahmed of the Institute of Marine Biology, University of Karachi, furnished the parasites of *Petrolisthes bosicii* and *P. rufescens* which he had collected. Dr. T. H. Butler of the Pacific Biological Station, Nanaimo, British Columbia, sent the parasites of *Sesarma mederi*. Prof. Dr. L. B. Holthuis of the Rijksmuseum van Natuurlijke Historie, Leiden, identified the infested *Processa aequimana* and provided information about *Sesarma mederi*. Dr. M. Koshy of the Zoological Society of India, Calcutta, arranged for the loan of the holotype of *Dicropleon processae*. This report was prepared under National Science Foundation grant DEB 76-20102 administered through the Bermuda Biological Station for Research, Inc., of which this is a scientific contribution.

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